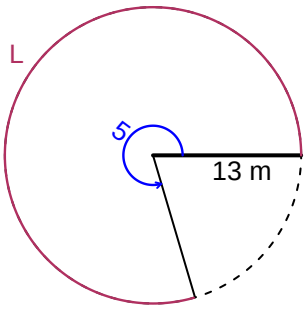
Name: Date:

Trig Final (Solution v13)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 13 meters. The angle measure is 5 radians. How long is the arc in meters?

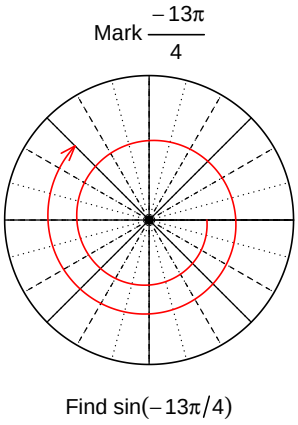


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

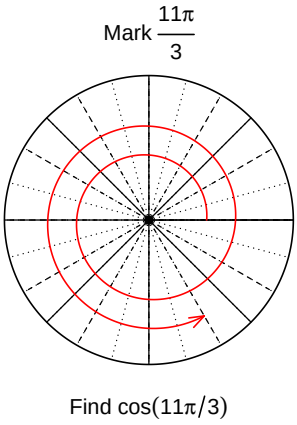
$L = 65$ meters.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{4}\right)$ and $\cos\left(\frac{11\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(-13\pi/4)$



Find $\cos(11\pi/3)$

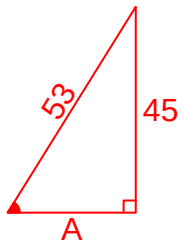
$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(11\pi/3) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{-45}{53}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

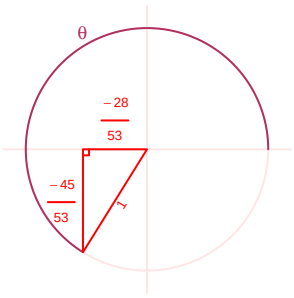
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 45^2 = 53^2$$
$$A = \sqrt{53^2 - 45^2}$$
$$A = 28$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-45}{53}}{\frac{-28}{53}} = \frac{45}{28}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 7.96 Hz, an amplitude of 4.48 meters, and a midline at $y = 6.68$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 4.48\sin(2\pi 7.96t) + 6.68$$

or

$$y = 4.48\sin(15.92\pi t) + 6.68$$

or

$$y = 4.48\sin(50.01t) + 6.68$$